Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Delete, Delete, Delete	)	GN Docket No. 25-133
	)	
Unlicensed Use of the 6 GHz Band	)	ET Docket No. 18-295
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	
	)	

COMMENTS OF CISCO SYSTEMS, INC.

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INTRODUCTION AND SUMMARY

Cisco Systems, Inc. ("Cisco") appreciates the opportunity to submit comments in response to the Federal Communications Commission's ("FCC" or "Commission") *Public Notice* requesting input on rules to repeal or modify for the purpose of alleviating unnecessary regulations.[1] Cisco is a global provider of IP-based networking equipment, solutions, and services, and a market leader in Wi-Fi and other wireless network solutions. We applaud the Commission's effort to identify and eliminate rules that are "unnecessary in light of current circumstances" and "stand in the way of deployment . . . and technological innovation."[2]

Demand for cruise ship travel has reached an all-time high: nearly 20 million Americans will travel on cruise ships this year—a 4.5% increase over 2024.[3] Indeed, demand growth for cruise lines is steadily outpacing that for traditional hotels,[4] and annual revenue for the U.S. cruise market is expected to grow from about $3.7 billion in 2024 to nearly $7.6 billion by 2030.[5] As demand for cruise vacations increases, however, FCC policy is hindering this important sector. Specifically, in 2020 the FCC imposed sweeping Wi-Fi rules for boats without considering their impact on cruise ships. Five years later, it's time to correct that oversight.

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1 *In Re: Delete, Delete, Delete*, Public Notice, DA 25-219, GN Docket No. 25-133 (rel. Mar. 12, 2025) ("*Public Notice*").

2 *Id.* at 1.

3 Aixa Diaz, *Record 19 Million Americans Projected to Cruise This Year*, AAA NEWSROOM (Jan. 27, 2025), https://newsroom.aaa.com/2025/01/aaa-record-19-million-americans-projected-to-cruise-this-year/.

4 *See id.*

5 *U.S. Cruise Market Size & Outlook, 2024-2030*, HORIZON DATABOOK BY GRAND VIEW RSCH., https://www.grandviewresearch.com/horizon/outlook/cruise-market/united-states (last visited Apr. 9, 2025).

In 2020, the Commission responded to the increasing congestion in legacy Wi-Fi spectrum bands with its historic *6 GHz Report and Order* authorizing low-power indoor ("LPI") operations throughout the full 1200 megahertz of the 6 GHz band.[6] But that decision included a key exception, prohibiting such operations on boats and other moving vehicles.[7] At the time it issued these rules, the Commission did not consider, and thus never assessed, the costs and benefits of operating 6 GHz LPI access points on cruise ships.

Cruise lines work closely with equipment and solutions providers like Cisco to provide the best possible Wi-Fi service. Cruise ships can carry as many as 10,000 passengers and crew, all relying on the ship's Wi-Fi connectivity. This demand can impact Wi-Fi performance, especially in large, indoor, congested areas of these ships. As one cruise line's passengers put it, "Sea days are rough for wifi, everyone is using it" and the Wi-Fi "can get congested and can be unstable."[8]

Access to 6 GHz spectrum, even if only at low power indoors, will dramatically improve the Wi-Fi experience for American passengers and ship operations. Moreover, the risk of

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[6] *See Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd. 3852 (2020) ("*6 GHz Report and Order*").

[7] *Id.* ¶ 207 (holding that "the use of unlicensed access points shall not be permitted in moving vehicles such as cars, trains, ships, or small aircraft"); *see* 47 C.F.R. § 15.407(d)(1)(iii) ("Operation of standard power access points, fixed client devices, and indoor access points in the 5.925-7.125 GHz band is prohibited on boats."); *id.* § 15.407(d)(4) ("In the 5.925-7.125 GHz band, indoor access points and subordinate devices must bear the following statement in a conspicuous location on the device and in the user's manual: . . . The operation of this device is prohibited on oil platforms, cars, trains, *boats*, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.") (emphasis added).

[8] *See* u/brad-attitude, *How's the Wifi on Board for Video Calls?*, REDDIT, https://www.reddit.com/r/royalcaribbean/comments/1gxcpgd/hows_the_wifi_on_board_for_video_calls/ (last visited Apr. 9, 2025) (comments in response to a question in the Royal Caribbean subreddit regarding the Wi-Fi quality on cruise ships).

harmful interference to other operations is low. The unique construction of cruise ships results in high building attenuation, limiting the risk of harmful interference to incumbent licensed services in the band. Further, relying on existing statutory definitions, the Commission can easily distinguish cruise ships from other types of vessels for the purposes of its rules.

Therefore, Cisco requests that the Commission slightly adjust its rules to enable the operation of 6 GHz LPI access points on cruise ships. Removing the current restriction will spur innovation and economic growth within the burgeoning cruise ship industry, while enhancing convenience and providing significant public benefits for the millions of Americans who vacation on these vessels.

I. ENABLING 6 GHZ LPI ACCESS POINTS ON CRUISE SHIPS WILL ENHANCE WI-FI SERVICE WHILE SAFEGUARDING INCUMBENT OPERATIONS.

In the *Public Notice*, the Commission asks whether "there [are] rules that, if eliminated or modified, could result in greater benefits relative to the associated costs of the new regulatory framework."[9] In the case of permitting 6 GHz unlicensed operations on cruise ships, the answer is yes. The Commission should modify its rules prohibiting 6 GHz LPI access points from operating on boats by creating a narrow exemption for cruise ships. This exemption would support this important industry, increase access to innovative technology by improving indoor Wi-Fi service for passengers and critical operations, and maintain a low risk of harmful interference to incumbent operations in the 6 GHz band.

[9] *Public Notice* at 3.

A. Operation of 6 GHz LPI Access Points on Cruise Ships Would Significantly Improve Wi-Fi Performance for Ship Operations and the Millions of Americans Who Travel on Cruise Ships Each Year.

In our increasingly connected age, cruise ship Wi-Fi is not a luxury—it is a necessity. Passengers use Wi-Fi to access advisories and other information from the cruise operator, stream movies and other content from the ship's data centers, communicate via the ship's app, make calls via Wi-Fi calling, and access the internet. Entertainment venues aboard the ships use Wi-Fi connectivity for lighting and sound control, and some cruise ships are experimenting with artificial and virtual reality ("AR/VR") for gaming, dining, retail, and other use cases.[10]

Further, Wi-Fi not only enhances the passenger experience but also ensures the safe and efficient operation of the vessel. Wi-Fi provides crew members with real-time access to navigational data and weather forecasts.[11] Cruise ships increasingly employ Wi-Fi-connected sensors and Internet of Things ("IoT") devices to monitor engines and other ship systems and facilities, and for security applications.[12] Wi-Fi can also facilitate communication between cruise ships and port authorities, and between and among crew members and passengers, which

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[10] *See* Sienna Smith, *AR and VR for Enhancing Cruise Ship Entertainment and Activities*, ARVR TRAVEL (Dec. 27, 2024), https://arvrtravel.com/2024/12/27/ar-and-vr-for-enhancing-cruise-ship-entertainment-and-activities/.

[11] *See Optimizing Maritime Wi-Fi for Cruise Ships, Container Ships, and More*, 7SIGNAL (Aug. 29, 2023), https://www.7signal.com/news/blog/optimizing-maritime-wi-fi-for-cruise-ships-container-ships-and-more.

[12] *See id.*; *The Role of IoT in Enhancing Cruise Ship Operations*, COLUMBIA CRUISE SERVS. (Feb. 9, 2024), https://columbia-cs.com/the-role-of-iot-in-enhancing-cruise-ship-operations/; *see also* Simon Maher, *A New Era of Connectivity at Sea*, CRUISE INDUS. NEWS (Apr. 5, 2022), https://cruiseindustrynews.com/cruise-news/2022/04/a-new-era-of-connectivity-at-sea/ (stating that "the number of smart devices connected to a ship's network is soon expected to exceed as many as 10,000 devices").

can be especially important during emergencies.[13] In short, "Wi-Fi has become an essential tool" for critical operations on cruise ships.[14]

Currently, however, there is insufficient spectrum available in large, congested indoor common areas of cruise ships, such as restaurants, casinos, theaters, and promenades. Despite the efforts of the cruise ship operators, equipment manufacturers, and their partners, this can impact Wi-Fi performance. As one cruise line passenger describes, "[T]he congested parts of the ship have very poor WiFi. The promenade, the pool, coffee shops, guest services etc. . . . [t]he poor [access points] can't handle it during pe[a]k times."[15]

Channel reuse is typically the most efficient method of spectrum management for crowded locations like cruise ships, with thousands of users packed closely together. This requires deploying many low-powered access points throughout a cruise ship's common areas. Thus, a typical cruise ship requires thousands of access points to carry vast amounts of traffic in its indoor common areas. Depending on the size and age of the vessel, cruise ships typically deploy over 4,000 access points throughout their hallways, ceilings, and cabins—more access points than an average NFL stadium.

The inability to use the 6 GHz band, however, limits cruise ships' non-overlapping channels, leading to increased co-channel and adjacent channel interference. The table below illustrates the challenge of Wi-Fi access on such ships. The table shows channel utilization in the 5 GHz band with a client device connected to a single access point on a well-known cruise

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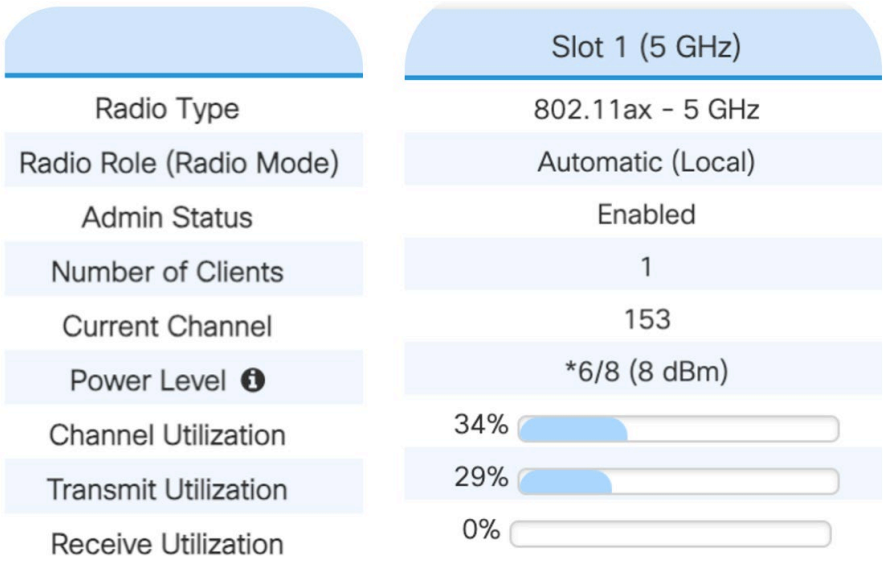
13 *See Optimizing Maritime Wi-Fi*, *supra* note 11.

14 *Id.*

15 *Question on WiFi*, FACEBOOK, https://www.facebook.com/groups/royalcaribbeancruising group/posts/3722985231254950/ (last visited Apr. 9, 2025) (comment from an engineer in response to a question in the "Royal Caribbean Cruising" Facebook group regarding the Wi-Fi quality on cruise ships).

ship. Due to the large number of access points necessary to provide adequate coverage and capacity throughout the diverse spaces within a cruise ship, channel utilization is extremely high even with only a single client device.



	Slot 1 (5 GHz)
Radio Type	802.11ax - 5 GHz
Radio Role (Radio Mode)	Automatic (Local)
Admin Status	Enabled
Number of Clients	1
Current Channel	153
Power Level	*6/8 (8 dBm)
Channel Utilization	34%
Transmit Utilization	29%
Receive Utilization	0%

Notably, the client device connected to the access point here is not even transmitting (receive utilization is zero percent). The channel usage in this scenario is driven entirely by the access point seeking to coexist with all the other access points on the vessel. Performance would degrade further once the client device begins transmitting or is joined by other client devices.

Access to the full 1200 megahertz of spectrum available for 6 GHz LPI operations would address this issue by facilitating channel reuse and allowing more simultaneous Wi-Fi operations, without compromising the quality of service. The 6 GHz band allows for a significantly higher number of non-overlapping, wider channels (e.g., 80 megahertz or 160 megahertz), which is crucial for optimizing operation and avoiding the excessive collisions and contention for airtime that are common in crowded areas. Such collisions slow response times, introduce latency, and disconnect devices from the network.

Increasing the number of 80-megahertz channels also substantially increases the likelihood of achieving gigabit speeds in dense environments and facilitates the best performance from advanced applications like AR/VR and artificial intelligence. Access to the 6 GHz band will also enable the deployment of next-generation Wi-Fi on 160-megahertz channels across the entire 6 GHz band. And with the recent availability of Wi-Fi 7, cruise ships will even be able to use 320-megahertz channels for their operations with the full 6 GHz band available.

Permitting the operation of 6 GHz LPI access points on cruise ships will help passengers and cruise lines receive the full benefits of enhanced 6 GHz coverage, throughput, and speed. 6 GHz-enabled client devices, including smartphones, laptops, and tablets, are widely available and undoubtedly already present on cruise ships.[16] Ultimately, expanding 6 GHz unlicensed operations advances the Commission's goals of "providing consumers[] ubiquitous connectivity to a full range of services regardless of location"[17] and "encouraging more efficient spectrum use."[18]

B. The Construction of Cruise Ships Makes the Risk of Harmful Interference from the Operation of 6 GHz LPI Devices Extremely Low.

The Commission prohibited 6 GHz LPI access points in moving vehicles, including boats, because of "the potential for increasing interference to incumbent services"[19] due to what

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16 North American shipments of 6 GHz-enabled consumer devices are expected to grow from 95 million in 2024 to an estimated 367 million in 2029. Andrew Spivey, ABI Rsch., *Wi-Fi Innovation and Future Spectrum Allocation*, at 2 (2024), https://go.abiresearch.com/lp-wi-fi-innovation-and-future-spectrum-allocation.

17 *6 GHz Report and Order* ¶ 1.

18 *See Wi-Fi Alliance Request for Waiver of Section 15.407(1)(2) of the Commission's Rules for AFC System Operation in the 6 GHz Band*, Order, DA 24-1217, ET Docket No. 23-107, ¶ 14 (OET rel. Dec. 5, 2024) ("BEL Waiver").

19 *6 GHz Report and Order* ¶ 207.

it perceived to be insufficient building attenuation.[20] However, signals within cruise ships experience high building entry loss ("BEL") due to the vessels' thick metal walls and thermally efficient glass windows.[21] A ship hull, for example, is typically made of steel that can be up to 40 mm thick.[22] As a result, the signals transmitted by LPI access points will be significantly attenuated when passing through a cruise ship's walls. Cruise ships are also likely to have far higher BEL than traditional land-based hotels, which do not have walls made of metal. Indeed, in Europe, 6 GHz rules explicitly permit LPI Wi-Fi operations in "trains with metal-coated windows" or "similar structures."[23]

The Commission recently affirmed the relevance of BEL and attenuation for determining allowable 6 GHz operations. In that decision, the Commission permitted automated frequency coordination ("AFC") systems to incorporate BEL into their algorithm for determining permissible composite LPI/standard-power device operating channels and power levels.[24] In doing so, the Commission found that this would not only "increas[e] the[] utility [of access points] to consumers" but also "enable the access points to provide increased indoor coverage and/or provide higher data rates."[25]

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20 *See id.* ¶ 212.

21 *See* Janne Heiskari et al., *On the Lightweight Design of Laminated Insulating Glass Units in Cruise Ships*, 19 SHIPS AND OFFSHORE STRUCTURES 1 (Sept. 13, 2024), https://www.tandfonline.com/doi/full/10.1080/17445302.2024.2403163.

22 *See, e.g.*, *An Oasis on the Sea*, ARCELORMITTAL, https://industry.arcelormittal.com/market-segments/steel-for-transport/stxfranceA34 (last visited Apr. 9, 2025).

23 Commission Implementing Decision (EU) 2024/3157 of 17 Dec. 2024, annex, 2024 O.J. (L) 1, 3 at tbl.1 & n.1, http://data.europa.eu/eli/dec_impl/2024/3157/oj.

24 *See* BEL Waiver ¶ 14.

25 *Id.*

Unfortunately, the Commission overlooked the varying BEL and attenuation characteristics in different in-motion contexts, such as cruise ships, when it prohibited 6 GHz operations on all boats and other moving vehicles. The Commission should remedy that oversight now and account for the high BEL on cruise ships—limiting interference risk—and make a slight modification to its rules to permit 6 GHz LPI operations.

C. The Underlying Reason for the Prohibition of 6 GHz LPI Devices on Boats May No Longer Be Valid.

In 2020, the Commission prohibited 6 GHz LPI access points from operating on boats and oil platforms to protect Earth Exploration-Satellite Services ("EESS") remote sensing measurements taken over the ocean,[26] a concern raised by the National Academy of Sciences' Committee on Radio Frequencies ("CORF"). CORF argued that the 6.425-7.075 GHz and 7.075-7.250 GHz bands used for remote sensing by EESS, including over oceans, must be protected.[27]

However, the 2023 World Radiocommunication Conference resolved to migrate the EESS ocean sensing operations out of the 6 GHz band to the 4200-4400 MHz and 8400-8500 MHz bands.[28] Thus, the Commission's reason for adopting this prohibition in 2020 on 6 GHz LPI usage on boats may no longer be valid once EESS operations transition out of the

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[26] *6 GHz Report and Order* ¶ 212.

[27] Comments of the National Academy of Sciences' Committee on Radio Frequencies at 8-9, ET Docket No. 18-295, GN Docket No. 17-183 (filed Feb. 14, 2019).

[28] *See* Int'l Telecomm. Union, *World Radiocommunication Conference 2023 (WRC-23) Final Acts*, Res. 674 (WRC-23) at 565-66 (2023), https://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.16-2024-PDF-E.pdf (resolving to complete by 2027 "sharing and compatibility studies to determine the possibility of a future allocation to the EESS (passive) in frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz" and to examine these study results "with a view to considering a new primary allocation" for EESS in these bands).

6 GHz band. Notably, there is already support in the record for lifting the prohibition on unlicensed operations on ships considering this shift in EESS operations.[29]

II. THE COMMISSION CAN NARROWLY DRAFT ANY RULE CHANGE TO APPLY ONLY TO CRUISE SHIPS.

The Commission can rely on existing statutory definitions to distinguish cruise ships from other types of boats/vessels for the purposes of its rules. Certain factors unique to cruise ships distinguish them from other types of vessels: size (e.g., length and weight); number of passengers; and the length, geography, and purpose of the service. The Code of Federal Regulations defines a "cruise ship" similarly in a range of different maritime contexts.[30] The U.S. Code also includes a comparable definition.[31] For example, in the context of maritime security, the Code of Federal Regulations defines a "cruise ship" as

> [A]ny vessel over 100 gross register tons, carrying more than 12 passengers for hire which makes voyages lasting more than 24 hours, of which any part is on the high seas. Passengers from cruise ships are embarked or disembarked in the U.S. or its territories. Cruise ships do not include ferries that hold Coast Guard Certificates of Inspection endorsed for "Lakes, Bays, and Sounds", that transit international waters for only short periods of time on frequent schedules.[32]

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[29] *See, e.g.*, Reply Comments of Wi-Fi Alliance at 7, ET Docket No. 18-295, GN Docket No. 17-183 (filed Apr. 26, 2024).

[30] *See, e.g.*, 33 C.F.R. § 101.105; *id.* § 165.835(a) ("*Cruise ship* means a passenger vessel over 100 gross tons, carrying more than 12 passengers for hire, making a voyage lasting more than 24 hours any part of which is on the high seas, and for which passengers are embarked or disembarked in the United States or its territories."); 36 C.F.R. § 13.1102 (defining "cruise ship" as "any motor vessel of at least 100 tons gross (U.S. System) or 2,000 tons gross (International Convention System) certificated to carry more than 12 passengers for hire").

[31] *See* 46 U.S.C. § 70101 (defining in the statutory notes a "cruise ship" as "a vessel on an international voyage that embarks or disembarks passengers at a port of United States jurisdiction . . . and that provides overnight accommodations").

[32] 33 C.F.R. § 101.105.

Based on those statutory definitions, the Commission can differentiate a "cruise ship" from other vessels, such as large yachts, ferries, or cargo ships. To constitute a "cruise ship," the following factors must be present:

- Large passenger vessel, over 100 gross tons in weight and 200 feet in length.[33]
- Engages in business.
- Travels a defined route that lasts over 24 hours, of which any part is on the high seas.
- Capable of carrying more than 12 overnight passengers-for-hire.[34]
- Embarks or disembarks passengers in the United States or its territories.

Further, cruise ships are statutorily distinct from other types of vessels. For example, under definitions in the National Park Service statutes, both a charter vessel[35] and a tour vessel[36] must weigh less than 100 tons gross—making them smaller than a cruise ship. Charter vessels are also limited to no more than 12 overnight and 49 daytime passengers. In contrast, Royal Caribbean's "Icon of the Seas" cruise ship carries a maximum of 7,600 passengers and 2,350 crew members.[37] Moreover, cruise ships often include multiple decks, restaurants, bars,

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[33] *See id.* § 165.169(a)(14) (defining "cruise ship," in part, as a vessel that is "200 or more feet in length"); 36 C.F.R. § 13.1102 (distinguishing cruise ships from charter and tour vessels, in part, using a weight threshold of "100 tons gross (U.S. System) or 2,000 tons gross (International Convention System)"; cruise ships are above that weight and charter and tour vessels are below that weight).

[34] *See id.* (distinguishing cruise ships from charter vessels, in part, through a limit of 12 overnight passengers for charter vessels).

[35] A charter vessel is defined as "any motor vessel under 100 tons gross (U.S. System) or 2,000 tons gross (International Convention System) engaged in transport of passengers for hire and certified to carry no more than 12 passengers overnight and no more than 49 passengers for daytime use." *Id.*

[36] A tour vessel is defined as "any motor vessel of less than 100 tons gross (U.S. System) or 2,000 tons gross (International Convention System) engaged in transport of passengers for hire and certificated to carry more than 12 passengers overnight or more than 49 passengers for daytime use." *Id.*

[37] Bernadette Chua, *Ultimate Guide: Icon of the Seas*, CRUISE PASSENGER (Feb. 4, 2025), https://cruisepassenger.com.au/royal-caribbean-cruises/icon-of-the-seas-guide/.

spas, casinos, and other entertainment. When docked, a cruise ship more closely resembles a hotel or a resort than a boat.

Much like it distinguished commercial airplanes from other "aircraft" in allowing the operation of unlicensed 6 GHz LPI devices inside large aircraft operating above 10,000 feet,[38] the Commission should distinguish cruise ships from other types of vessels and slightly modify its rules to exempt cruise ships from the prohibition against 6 GHz LPI operations on boats. Creating this exemption for cruise ships will also preempt the need for "repeated waivers of the rule."[39] As the Commission explains in the *Public Notice*, such a need for multiple waivers "could suggest the rule is unnecessary, inappropriate, or at least ill-suited to its purpose."[40] The most efficient use of Commission resources would be to adopt this narrow exemption for 6 GHz LPI operations on cruise ships.

CONCLUSION

Cisco commends the Commission for reexamining its existing rules to repeal or modify those that are unnecessary and pose obstacles to beneficial deployments and technological advancements. Because the existing rule is clearly unreasonable and the benefits of a change are similarly clear, the Commission should promptly amend its rules to permit the operation of 6 GHz LPI access points on cruise ships. Not only would this minor modification advance the Commission's connectivity and spectrum-efficiency goals, but it would also drive innovation and

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38 *6 GHz Report and Order* ¶ 214; 47 C.F.R. § 15.407(d)(1)(iv).

39 *Public Notice* at 3.

40 *Id.*

expand technological access for this growing industry and the tens of millions of Americans who embark on cruises for years to come.

Respectfully submitted,

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